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the teeth commonly [illegible] [illegible] about as long as the leaves; sepals lanceolate, acute, glabrous to hirtellous; petals yellow, usually tinged with brown-purple on the outside, lateral petals bearded, spur short, the three lower petals purple-veined; capsule puberulent.

Dry slopes.

Oregon: Harney, Douglas, [illegible], [illegible], [illegible], [illegible], [illegible], [illegible] and Clark Counties.

7a. VIOLA [illegible] var. [illegible] [illegible], Pl. [illegible] [illegible]. 1901.

V. [illegible] Greene, Pittonia 3: [illegible]. [illegible].

Plants 5-15 cm. tall, usually taller and more slender than var. [illegible], [illegible] appearance, [illegible] that commonly the upper surface of leaf is almost glabrous; leaves ovate to lanceolate, margins entire to remotely dentate, the first leaves sometimes slightly [illegible]; flowers [illegible] as in the var. [illegible], except that commonly only the two upper petals are strongly tinged with brown-purple.

[illegible].

Oregon: [illegible], [illegible] and [illegible] Counties.

CONTRIBUTIONS TOWARD

A FLORA OF NEVADA. NO. 31.

- - -

PAPAVERACEAE OF NEVADA

by

Robert F. Martin

May 21, 1941

Issued by

The Division of Plant Exploration and Introduction,
Bureau of Plant Industry,
U. S. Department of Agriculture,
Washington, D. C.

- - -

Works Projects Administration of Nevada
Projects, O. P. 65-2-04-13, W. P. 658;
O. P. 165-2-04-21, W. P. 752.

- - -

Collaborator

University of Nevada.

Address all queries concerning this publication to the Division of Plant Exploration and Introduction, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

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PAPAVERACEAE OF NEVADA

By Robert F. Martin

With us annual or perennial herbs with milky, colored or watery sap, and glabrous, variously pubescent or prickly herbage; leaves exstipulate, alternate or in a basal tuft, entire, toothed, lobed or dissected; flowers perfect, regular, hypogynous (in Eschscholzia subperigynous), and usually showy; sepals 2 or 3, free (united in Eschscholzia), caducous, imbricate; petals ecalcarate, imbricate, deciduous (in Canbya and one species of Arctomecon semipersistent), twice as many as the sepals (exceptions occasionally in Canbya); stamens mostly numerous, free, with filiform filaments and longitudinally dehiscent 2-celled anthers; ovary 2 to 6-carpellate, mostly multiovulate, 1-celled and with parietal placentae; styles short or none; stigmas (or the stigmatic apices of the carpels) as many as the placentae, distinct or united, and erect, or often horizontally spreading to form a radially lobed body (in Canbya reflexed over the placentae); fruit capsular, opening by valves; seeds globose, ovoid, or cylindric-oblong, smooth or variously marked; embryo small; cotyledons entire or cleft.

As understood here the family contains about 20 genera and 100 species. Most of the species are quickly responsive to differences in habitat and of plastic genetic constitution, and attempts

by certain writers, notably Greene and Fedde, to give specific recognition to every variant have resulted in extensive multiplication of names. Of *Eschscholzia*, which I would view as containing about a dozen species, Fedde recognized 123.

Striking examples of discontinuous distribution are found in this family. The greater number of genera and species occurs in the Mediterranean Basin and extreme western North America - two regions climatically similar. But the small number of outlying genera shows equal disjunction of ranges: *Stylophorum*, with three species, is represented by *S. diphyllum* in eastern North America, while the other two species are found in central China; *Bocconia* has five species in tropical America and two in eastern Asia; and the species of *Meconopsis* occur in western Europe, the Himalayas and China, and California. The circumboreal Iceland poppy, *Papaver nudicaule*, has been called "the glory of the Arctic regions."

The Papaveraceae are closely related to the Fumariaceae, and the two families are often united. For convenience the separation is maintained here. The few stamens and irregular flowers of the Fumariaceae make their recognition at once apparent and easy, although fundamentally the families are more similar than different. The Papaveraceae also show affinity on one hand to the Capparidaceae and Cruciferae, and on the other to the Berberidaceae.

The following genera are cultivated as ornamentals: *Papaver* (poppy), *Chelidonium* (celandine), *Eschscholzia* (California poppy),

Platystemon (cream cup), *Sanguinaria* (blood root), *Stylophorum* (celandine poppy), *Dendromecon* (bush poppy), and *Bocconia* (plume poppy). As wild plants the corn poppy (*Papaver rhoeas*) and the California poppies are famed ingredients of their respective landscapes.

An oil pressed from the seeds of *Argemone* is said to have medicinal value. The rhizomes of *Sanguinaria* supply a sedative. But the most important product of the family is opium, from *Papaver somniferum*. The seed of the last-named species lack the narcotic principle and are marketed as "maw seed." They are widely used as bird food and a valuable oil is pressed from them.

Because of the quickly deciduous petals in most species Papaveraceae should be placed in the press as soon as collected, and since the sepals fall away as the flowers open, specimens with buds should always be taken. The fruit of most species as well as the seed has diagnostic value and should accompany specimens whenever possible. The color of the sap should be noted.

Helpful in the study of western North American Papaveraceae are: Curran (later Brandegee), Proc. Calif. Acad. Sci. 2nd ser. 1: 237-251. 1888; Gray, Proc. Am. Acad. 22: 270-273. 1886, and Syn. Fl. N. Am. 1 (1): 82-92. 1895; Jepson, Fl. Calif. 1: 553-575. 1922. The most pretentious systematic treatment is that of Fedde, Pflanzenreich 4 (104). 1909. This work followed Greene in taking an extremely narrow view as regards species, and its chief value is as a bibliography. An excellent general account of the family is Baillon, Hist. Plantes 3: 105-143. 1872.

KEY TO GENERA

1. Sepals united to form a calyptra; flowers sub-perigynous; capsule valves opening from the base upward; leaves ternately dissected . . . . 1. Eschscholzia.

1. Sepals free; flowers hypogynous; capsule opening from the apex downward; leaves various but not ternately dissected.

    2. Minute annual; leaves all basal and filiform; stigmas separate, reflexed over the placentae . . . . 2. Canbya.

    2. Larger herbs; leaves not filiform; stigmas erect and more or less connivent.

        3. Herbage prickly . . . . 3. Argemone.

        3. Herbage not prickly.

            4. Capsule 4-to 6-valved, the interior hollow; pubescence, where present, long pilose. 4. Arctomecon.

            4. Capsule 2-valved, the interior filled with a spongy growth in which the seed are imbedded; scurfy pubescent herb . . . . 5. Glaucium.

Platystemon californicus Benth., an annual with cream-colored flowers, opposite or whorled entire leaves, and with numerous, linear, 1-carpellate ovaries that separate in fruit and break transversely into 1-seeded, indehiscent joints, should be sought in Nevada. It is known from Baja California, California, Oregon, Utah, and Arizona.

1. ESCHSCHOLZIA Cham.[1/] California poppy.

ESCHSCHOLZIA Cham. in Nees, Horae Phys. Berol. 73. 1820; Cham. & Schlecht., Linnaea 1: 553. 1826; Benth. & Hook., Gen. Pl. 1: 54. 1862; Greene, Bull. Calif. Acad. Sci. 1: 66, 182. 1885; Gray, Proc. Amer. Acad. 22: 271. 1886; Curran, Proc. Calif. Acad. Sci. 2nd ser. 1: 240, 245. 1888, and (as Brandegee) Zoe 1: 278. 1890; Prantl & Kündig in Engler & Prantl, Natürl. Pflanzenfam. 3 (2): 139. 1891; Gray, Syn. Fl. N. Am. 1 (1): 90. 1895; Greene, Pittonia 5: 205. 1905; Fedde, Pflanzenreich 4 (104): 144. 1909; Jepson, Fl. Calif. 1: 564. 1922; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925. Type species: _E. californica_ Cham.

Chryseis Lindl., Bot. Reg. t. 1948. 1837; Torr. & Gray, Fl. N. Am. 1: 63. 1838. A substitution because it was thought the labiate genus _Elsholtzia_ was similar enough to be homonymic. Type species: _C. compacta_ Lindl. (= _E. californica_ Cham.)

Receptacle produced into a cup-like hypanthium (flower subperigynous) and continued above the level of insertion of the calyx, corolla and stamens as a free rim, this in two of our species is horizontally spreading to form the "collar"; sepals completely coalesced to form a hood-like structure, the "calyptra", which is pushed off by the expanding petals; Petals 4, broadly obovate-cuneate, spreading or ascending; stamens several, anthers oblong-linear, longer than the short, flattened filaments; ovary linear-cylindric, 4-carpellate, 1-celled, each carpel terminated by a free, linear stigma; placentae 2, multiovulate; fruit a linear, costate capsule, dehiscing from the base upward by 2 valves; seed numerous, crestless, with reticulate, sub-echinate or pitted testa.

[1/] In most of the citations given here the spelling is _Eschscholtzia_; but the original spelling was _Eschscholzia_.

Annual or perennial taprooted herbs with watery sap, alternate, ternately dissected, petioled leaves, and usually showy flowers, borne either in bracted racemes or on long naked peduncles.

Species about 12, natives of Pacific America from Oregon to Baja California; a few in the Great Basin, one of which ranges east to Texas and Chihuahua. Eschscholzia californica is now naturalized in Australia and India.

An interesting method of mechanical seed dispersal has been developed by Eschscholzia and perhaps related genera. Contrasting with the common mode of the family, that is dehiscence by reflexion of the carpels from the apex downward, in Eschscholzia the dehiscence is from the base upward. Since the lower part of the capsule is enclosed by the cup-like hypanthium, opening of the valves is arrested immediately it begins. At maturity, by means of some process not now known, but conjecturally by development of an abscission layer or by disintegration of tissue, the capsule is freed from the stalk, though still held by the hypanthium. When the capsule is finally delivered by some agency such as the wind, the now unhampered valves snap upward and the seed is scattered over a small area about the parent plant.

Its abundance and extravagant flowering weighed, Eschscholzia got a late place in literature. Menzies 2/ was its first collector;

2/ Archibald Menzies, 1754-1842, Scotch physician and naturalist, was the botanist of Vancouver's expedition. He made natural history collections along the Pacific Coast from 1792 to 1794, and is remembered botanically in the genus Menziesia.

but his specimens were distributed without name, although it was suggested a new genus was represented.

In 1816 Chamisso[3] collected E. californica at San Francisco, and in 1820 it was described and illustrated. During the next 65 years an occasional new name was proposed, and in 1885 Greene, in a short paper on the genus, recognized eight species, five of them new.

Twenty years later, Greene, having continued his studies on the genus, brought out a monograph in which 112 species were recognized.[4] Most of the horde of new species were segregates of E. californica, and the greater part of them were based on single or at

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[3] Louis Charles Adelaide Chamisso de Boncourt was born in Champagne, France, in 1781, and died in Berlin in 1838. His ancestry being aristocratic, it was found judicious to remove him to Prussia during the Reign of Terror. Later, during the Napoleonic Wars, he fought against, and was taken prisoner by, his former countrymen. Dissatisfied with his position in Europe following the return of Napoleon from Elba, he applied for and received appointment as naturalist to the expedition sponsored by Count Romanzoff and commanded by Lieutenant Kotzebue. This voyage lasted three years and a great amount of original though disconnected data were gathered by Chamisso. According to the records, his personal position on board ship was not an enviable one, Kotzebue being especially unsympathetic. Dr. Johann Friedrich Eschscholz, the ship's surgeon, was the exception and he and Chamisso became fast friends. The dedication of Eschscholzia naturally followed.

Chamisso's claim to fame as a botanist is far overshadowed by his reputation as a man of letters. The Germans, while conceding his French origin, claim him as one of their own great literary ornaments. "The Wonderful History of Peter Schlemil" is his best known work. It is surprising to find Chamisso - a combiner of botany and letters, two professions where common sense is notoriously deficient - once concluded a bit of doggerel, occasioned by the naming in his honor of a species of beetle and a genus of plants, with the observation that a pension would have been more to his liking.

[4] A fair sample of the regard in which Greene held his own work is shown in his review of the earlier paper. With customary

most two or three collections. As early as 1888 Katherine Brandegee (then writing as Mary K. Curran) began experimental observations that finally resulted in proving the small worth of Greene's species. Prof. Jepson in his "Flora of California" has summarized the field and garden studies on _E._ _californica_, and with compelling evidence demonstrates the futility of trying to maintain as species the infinite variations of the California poppy.

Greene's work, although burdening botanical literature with a plethora of synonyms, did serve to direct attention to the genus, and as a result it stands, at least as field behavior goes, the best understood of American papaveraceous genera.

Fedde's treatment of the genus in "Das Pflanzenreich" is essentially a translation of Greene's paper plus a number of Fedde's species inserted. These last are without exception, as far as I can tell, utterly without value.

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humility it went:

> "Other crudities in this my earliest monographic effort are now to me, after the lapse of twenty years, so apparent that I never refer to the document unless obliged to do so. Nevertheless, and despite its failings, fairly considered, it must seem to have been predestined to mark strongly an epoch in the history of the genus."

Continuing this self-criticism in the same merciless vein, there appears a little farther on:

> "The scientific force and value of that imperfect paper of 1885 lay in its essential originality. * * * It was a discovery that had been waited for by my contemporaries."

KEY TO SPECIES

1. Perennial (perhaps flowering the first year); cotyledons
   cleft . . . . 1. _E._ _californica._

1. Annual; cotyledons entire.
   2. Flowers small, petals 8 mm. long or less.
      3. _E._ _minutiflora._
   2. Flowers larger, petals 12 mm. long or more.
      3. Receptacle with a flaring rim, the "collar"; seeds
         reticulate . . . . 2. _E._ _mexicana._
      3. Receptacle rim not flaring; seeds pitted.
         4. _E._ _glyptosperma._

1. ESCHSCHOLZIA CALIFORNICA Cham. in Nees, Horae Phys. Berol. 74. t. 15. 1820.

_E._ _leptandra_ Greene, Pittonia 1: 170. 1888; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 217. 1925.

_E._ _nevadensis_ Fedde, Rep. Nov. Spec. 2: 146. 1906.

Perennial but (at least in California) flowering the first year; stems, in the Nevada collections, erect or nearly so, few-branched at the ground and above, 20 to 35 cm. high; basal leaves on petioles to 10 cm. long; stem leaves few to several, on shorter petioles; flowers on peduncles to 5 cm. long; calyptra ca. 2 cm. long, produced into a prominent beak; receptacle with a prominent collar; petals 2 to 3.5 cm. long; capsule 5 to 8 cm. long; seed scurfy-reticulate; cotyledons deeply cleft.

Southern California to Oregon and northwestern Nevada.

Illustrations: Nees, Horae Phys. Berol. t. 15; Bot. Reg. t. 1168; Parsons, Wild Fl. Calif. 115; Bailey, Stand. Cycl. Hort. t. 38 and p. 1423; Nat. Geogr. Mag. 31: 502.

Nevada: Douglas County - Carson Valley, 8 miles south of Minden, Lehenbauer 25; Genoa, Jones 5 June, 1897, type of E. nevadensis Fedde. Washoe County - 5 miles northeast of Verdi, Allen 31.

Eschscholzia californica, judging by the few collections available, is quite uniform in habit in Nevada. In California it is one of the most variable of species. As mentioned before, Greene's attempt to gain order by treating each variant as a species has not proved tenable. Practically every organ of E. californica is subject to variation, and one plant during a season may assume forms and features satisfying the diagnoses of two or more of Greene's species.

The form which occurs in northwestern Nevada and adjacent California is separable according to Greene from true E. californica mainly by its erect habit and few leaves. Fedde's E. nevadensis is a further refinement; Greene's species being simply glaucous, while E. nevadensis is glaucous-pruinose. Jepson regards E. leptandra as a straight synonym of E. californica, and the same course is taken here.

Of all California plants, Eschscholzia californica ranks in fame only after the Bigtree and Redwood. The genus is present practically throughout California, but it is in the central valleys where its development is most spectacular; and no

sight is longer to be remembered than a slope in springtime where the new growth of grass among the wide-set oaks is stippled with thousands of orange-yellow blossoms.

It has been widely received as a garden ornamental, and in cultivation is usually treated as an annual. Due to the many forms the plant assumes an imposing list of garden names has come into being.

2. ESCHSCHOLZIA MEXICANA Greene, Bull. Calif. Acad. 1: 69. 1885; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925.

E. douglasii, var. parvula Gray. Plant Wright. pt. 2: 10. 1853.

E. parvula (Gray) Cockerell, Bot. Gaz. 26: 279. 1898.

Annual; stems several, 10 to 25 cm. high, usually erect, but in luxuriant specimens often decumbent; leaves 6 to 10 cm. long, mostly basal, but cauline ones not absent; pedicels 4 to 15 cm. long; rim of the receptacle forming a collar, but usually narrower than in E. californica; calyptra 12 to 15 mm. long, more or less prominently beaked; petals 15 to 30 mm. long, white or yellow, rarely pink; capsule 5 to 9 cm. long; seed scurfy-reticulate; cotyledons entire.

Southern Nevada to Texas, Sonora and Chihuahua.

Nevada: Clark County - Mica Springs, Jones 5039.

A not very convincing species, but hardly to be merged entirely with any of the others of our region. The flaring rim of the receptacle suggests it is not a distant relative of

E. californica. However, in all the embryos I have examined, 25 or 30, I think, the cotyledons are entire. In both Greene and Fedde's keys this is treated as a species with cleft cotyledons, but I rather feel the statement was based not so much on dissection as analogy.

The early association with E. douglasii of the plant now called E. mexicana may, in spite of the strange distribution that would then follow, represent the best disposal. I am not certain what E. douglasii really is, but there are Oregon collections that match our plant well indeed.

The characters used in the key - annual habit and entire cotyledons - furnish the sole means of telling E. mexicana from E. californica.

3. ESCHSCHOLZIA MINUTIFLORA Wats., Proc. Amer. Acad. 11: 122. 1876; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925.

E. ludens Greene, Pitt. 5: 272. 1905; Tidestrom, loc. cit.

E. minuscula Greene, loc. cit., p. 270.

E. micrantha Greene, loc. cit., p. 277.

Annual; stem 8 to 30 cm. long, usually much branched at the base and the branches decumbent, or in small specimens few branched and with these ascending or erect; basal leaves numerous, 3 to 8 cm. long, the cauline few, scattered, much smaller, and imperceptibly passing into the bracts of the raceme; receptacle without a collar; calyptra obtuse or apiculate, 2 to 3 mm. long; petals 2 to 8 mm. long, yellow; capsule 3 to

5 cm. long; seed scurfy-reticulate.

California to Arizona and Utah.

Illustrations: Pflanzenreich 4 (104): f. 24. subf. 5, 7, 14, 17.

Nevada: Clark County - Canary Canyon, Boulder Dam, Train 1588. Churchill County - Mountain Wells, Headley 50. Lincoln County - Quartz Springs, Pintwater Range, La Rivers & Hancock 640. Lyon County - 13 miles east of Dayton, Goodner & Henning 39. Mineral County - Walker River Valley, 20 miles east of Sweetwater, Archer 7293. Nye County - Rhyolite, Heller, 17 May, 1909. Storey County - 8.1 miles south southeast of Spanish Springs, Saarni 195. Washoe County - Truckee Pass, Watson 51.

In its small way, E. minutiflora is about as variable as E. californica, and, as would be anticipated, has received a number of rechristenings. The larger-flowered collections from Nevada are much like the variety darwinensis M. E. Jones (var. parishii (Greene) Jepson), which is supposed to be separable by having petals 6 mm. long or more. The collection of Watson cited above, which I take to be a duplicate of the type of E. minutiflora, has petals a full 6 mm. long.

4. ESCHSCHOLZIA GLYPTOSPERMA Greene, Bull. Calif. Acad. 1: 70. 1885; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925.

Annual; stem much branched but very short, the plant thus appearing acaulescent with a tuft of radical leaves; leaves

3 to 6 cm. long; flowers several, borne on naked unbranched peduncles 10 to 20 cm. long; receptacle without a collar; calyptra 8 to 12 mm. long, varying from nearly obtuse to prominently beaked; petals yellow, 12 to 25 mm. long; capsules 2.5 to 6.5 cm. long; seed gray, dimpled all over, and then the entire surface minutely pitted.

Southern California to Nevada, Arizona and Utah.

Illustrations: Pflanzenreich 4 (104): f. 24, subf. 32.

Nevada: Clark County - 19 collections seen. Train 1520 is a good example.

2. CANBYA Parry ex Gray

CANBYA Parry ex Gray,[5] Proc. Amer. Acad. 12: 51, t. 1. 1876; Prantl & Kündig in Engl. & Prantl, Natürl. Pflanzenfam. 3 (2): 142. 1891; Gray, Syn. Fl. N. Am. 1 (1): 85. 1895; Fedde, Pflanzenreich 4 (104): 386. 1909.

Sepals 3, broadly elliptic; petals 5 to 7, obovate, yellow or white, persistent or (in our species) at length deciduous; stamens 6 to 13, the filaments longer or shorter than the anthers; ovary 3-carpellate, ovoid-globose; style none, the 3 stigmas radially reflexed over the placentae; capsule membranous, opening from the apex by 3 valves; seed numerous, crestless, smooth, oblong-obovoid, slightly arcuate.

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[5] The author of the genus has usually been given as Parry or as Parry in Gray, but from the context of the original paper, it appears that the description and notes were of Gray's composition, although most of the information set forth was supplied by Parry.

Minute, glabrous annuals with few to many 1-flowered scapes arising from a basal tuft of fleshy, linear leaves. Two species known - the typical C. candida of the Mohave Desert and the following.

For a beautifully detailed illustration of the generic characters, see the plate by Isaac Sprague accompanying the original description.

The original species of the genus was a discovery of a party of three pioneer Western botanists, C. C. Parry, Edward Palmer, and J. G. Lemmon, who collected in the San Bernardino region in the spring of 1876. Parry, recognizing the botanical interest of the charming little annual, transmitted it to Asa Gray with the request that it be named in honor of their mutual friend, William M. Canby, an excellent Delaware botanist, and the name Canbya candida resulted.

The second species, C. aurea, was first collected nine years later by Thomas Howell, who found it growing on the sagebrush plains of southeastern Oregon. For more than thirty years this species was supposed to be restricted to Oregon, but the two collections of Mr. Train cited below extend its range definitely into Nevada.

Evidently compiled from information furnished by Parry, the following account of the field behavior of C. candida accompanied the original description:

> From the Sagina-like tuft of foliage at the surface of the ground rises a multitude of tiny peduncles or scapes,

> each tipped with a bright white flower, which lasts for many days; the petals (barely two lines long) opening at sunrise, and at sunset closing over the ovary, and at length permanently over the capsule, into a globular form, which the discoverer likens to a pearl * * *.

As remarked below, *C. aurea* differs in that the petals fall before the fruit ripens. Otherwise little or nothing has been written on the behavior of the species, and observations would be most welcome.

1. CANBYA AUREA Wats., Proc. Amer. Acad. 21: 445. 1896.

Leaves glaucescent, 5 to 10 mm. long; scapes 2 to 5 cm. long; petals 5 to 7, bright yellow, 3 to 5 mm. long; falling before maturation of the fruit; stamens 6 to 13, the anthers shorter than the filaments; fruit 2 to 3 mm. long.[6]

Northwestern Nevada and southeastern Oregon.

Nevada: Humboldt County - vicinity of Farnham Hot Spring, Train, 20 May, 193(?). Washoe County - Long Valley entrance to Charles Sheldon Antelope Refuge, *Train 2958*.

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[6] The Mohave Desert species, *C. candida*, is distinguished by its smaller flowers, white petals that are persistent over the fruit, green foliage, and by the very short filaments, which are exceeded by the anthers. In contrast to *C. aurea*, the floral parts of which are quite variable, the petals seem to be six pretty consistently, and the stamens range from six to no greater than nine.

3. ARGEMONE L. Prickly poppy.

ARGEMONE L., Sp. Pl. 508. 1753; Benth. & Hook., Gen. Pl. 1: 52. 1862; Prantl & Kündig in Engl. & Prantl, Natürl. Pflanzenfam. 3 (2): 141. 1889; Prain, Journ. Bot. 33: 129, 176, 207, 307, 325, 363, 1895; Gray, Syn. Fl. N. Am. 1 (1): 87. 1895; Fedde, Pflanzenreich 4 (104): 271. 1909; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925. Type species A. mexicana L.

Enomegra A. Nels., Key Rocky Mt. Fl. 27. 1902, and Bot. Gaz. 34: 365. 1902. Type species: Argemone hispida Gray (E. hispida (Gray) A. Nels.).

Sepals 3, broadly ovate, with a dorsal, sub-apical, spine-tipped evagination (the horn); petals 6, white in our species, broadly obovate-cuneate; stamens numerous, with filiform filaments and linear anthers; ovary 1-celled, 3 to 6-carpellate, multi-ovulate; stigmas sessile, each consisting of a fleshy, cordate body ventrally attached to a continuation of the ventral nerve of the carpel, and jointly forming a truncated conoid body; capsule ovoid or ovoid-cylindric, dehiscing (our species) to near the base; seed dark brown, spherical, cancellate, crested.

With us biennial (?) or short-lived, upright, perennial herb, with white sap, and bristly or prickly herbage, sepals and capsules; leaves alternate, more or less pinnately lobed; flowers very showy, borne on short pedicels in congested, few-flowered racemes at the summit of the stem and branches.

A remarkably puzzling genus, traditionally considered to comprise about 6 species, all natives of the temperate and

tropical regions of the New World;[7] one species, *A. mexicana*, now widely introduced in the warm regions of the World.

For reasons lamely set forth below, all Nevada specimens are here referred to one species. One collection, *Allen 104*, from the White Rock area, Desert Game Range, Clark County, suggests *A. intermedia* Sweet, but as all our other specimens seem to be nearer what is here called *A. platyceras*, and for want of better indicia, the former species is excluded.

1. ARGEMONE PLATYCERAS Link & Otto, Icones Pl. Rar. 1: 85. t. 43. 1832.

A. hispida Gray, Mem. Amer. Acad. n. ser. 4 (Pl. Fendl.): 5. 1849; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925.

A. munita Dur. & Hilg., U. S. Rep. Expl. Miss.-Pac. 5 (Williamson's Rep.) (3): 5. t. 1. 1855.

A. mexicana of Anderson, Cat. Fl. Nev. 117. 1870, not L.

A. platyceras, var. *hispida* Prain, Journ. Bot. 33: 367. 1895. Based on *A. hispida* Gray.

Enomegra hispida A. Nels., Key Rocky Mt. Fl. 27. 1902. Based on *Argemone hispida* Gray.

Argemone rotundata Rydb., Bull. Torr. Bot. Club. 29: 160. 1902.

A. platyceras, var. *hispida*, subvar. *rotundata* Fedde, Pflanzenreich 4 (104): 286. 1909. Based on *A. rotundata* Rydb.

A. platyceras, var. *hispida*, subvar. *subintegra* Fedde. l. c.

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[7] At the time of their discovery, 1776, David Nelson, the botanist of Cook's third voyage, collected a white-flowered *Argemone* in the Hawaiian Islands. Prain was unable to distinguish his specimen from *A. alba* Lestib. of the Southeastern United States.

Erect herb with white sap, fiercely prickly herbage, and often with the epidermis between the prickles covered with bristles; stem 40 to 75 cm. high, simple below, usually with short, ascending branches above; leaves 5 to 10 cm. long, obovate, the lower narrowed at base to winged petiole, the upper sessile and more or less clasping, the margins, midrib, primary nerves and often those of higher degree bearing prickles or bristles or both; bracts similar to the leaves, though smaller; sepals 17 to 20 mm. long, the horn with lateral prickles below the terminal spine; petals 3 to 4 cm. long; capsule 3.5 to 4 cm. long; densely spiny.

As the species is construed here, the range of *A. platyceras* is from middle Mexico to Wyoming, Nevada and California. The form represented by Nevada collections occupies the given range from the border States of Mexico northward.

Illustrations: Armstrong, Field Book West. Wild Flow. 163 (as *A. hispida*); U. S. Rep. Expl. Miss.-Pac. 5 (Williamson's Rep.) (3) t. 1. (As *A. munita*); Link & Otto, Icones Pl. Rar. 1: t. 43.

Nevada: Churchill County - vicinity of East Gate, *Allen 363*. Clark County - Charleston Park, *Clokey 5472*. Douglas County - between Carson and Smith Valleys, *Lehenbauer 138*. Elko County - Ruby Mountain Canyon, 35 miles northeast of Elko, *Breene 418*. Lander County - along U. S. Route 50, 10 miles west of Austin, *Goodner & Henning 625*. Lincoln County - Cave Valley, *La Rivers & Hancock 791*. Lyon County - American Flat

Canyon, west of Silver City, *Allen 133*. Nye County - mouth of Cottonwood Canyon, ca. 37 miles southwest of Austin, *Goodner & Henning 867*. Ormsby County - Eagle Valley, *Baker 1090*. Pershing County - Pah-Ute Mountains, *Watson 49*. Storey County - Six Mile Canyon, 1 mile southeast of Virginia City, *Allen 159*. Washoe County - 2 miles west of Reno Hot Springs, *Archer 5833*. White Pine County - Indian Creek, 16 miles north of McGill, *Train 976*.

A closer adherence to Prain's treatment would result in placing a number, perhaps the greater, of our specimens in *A. platyceras*, var. *hispida*. This variety is distinguished according to that author from the typical *A. platyceras* by the hispid nature of the plant, i.e., bristles among the prickles, by rotund petal apices, and by the horns of the sepals being merely triangular rather than broadly so.

The first of these characters lends itself well to herbarium study. Plants are to be found whose armament consists altogether of coarse prickles, with these well separated and the intervening surface perfectly smooth. Opposed to this is a type with a dense complement of bristles between the prickles. As they stand, one could of course set the second off as at least a valid variety. But attacking the whole folder of our Nevada material, we end up with not two stacks of specimens, but three - two for the extremes just mentioned and a third, about as large, containing a varied assortment of intermediates.

It may well be that derangement in Nevada specimens of relied-on distinctions is not enough to derogate var. hispida if in other parts of its range it stands away from the typical. But as will be mentioned below, another problem, untouched here, should be settled in a larger study before validity of the variety is passed upon. Present concern is whether it will be more helpful to treat A. platyceras as simple or as a species and a variety. Regarding the criterion of hispidity I should say the most digestible separation is one calling for the plant to be at least slightly hispid or not hispid at all. That is, plants very hispid and plants just a little hispid are the same, while plants not hispid are something else. It doesn't appeal. Among other difficulties there is the rasper of telling the point where a prickle ceases to be a prickle and becomes a mere bristle.

The character of a rounded or truncate petal apex will have to be checked in living plants because of the grievous processes visited upon Argemone flowers between field and herbarium. And the dissemblance of "broadly triangular" to merely "triangular" is too delicate for me.

Having decided for the present not to bother with A. platyceras var. hispida, we may as well pay passing notice to the possibility that some of the Nevada collections may represent A. intermedia Sweet, a species to be expected in the southern part of the State. The first hurdle before this proposition is: if it does occur, how can we identify it?

Forty-six years ago Prain wrote: "The greatest difficulty in the treatment of the genus has been experienced in the limitation of its species." Granted as framed, such a restatement of ancient learning seems only to make broad the phylactery, it is still true the species have never been satisfactorily distinguished. Prain pointed out rightly enough that the problem resolves into how many white-flowered species are to be kept, and by way of dictum insisted the solution rested in one of two ways - either to have a single, comprehensive, white-flowered species, or to distinguish several. All this last, to my way of thinking, misses the mark.

Nelson, in describing his genus Enomergra, appears to have been the first to observe that what we call A. platyceras has white sap. All the other herbaceous species have yellow sap. In setting A. platyceras apart from the other white-flowered argemones, Nelson moved in the right direction; the trouble was that in making a new genus he probably went too far. But by taking A. platyceras out of the scene a way was opened toward a logical arrangement of the remaining species. Excluding the little-known but abundantly distinct A. fruticosa Gray, a shrubby Mexican species, there is left a group of species, or a large, variable species, including white- and yellow-flowered forms, yet possessing the common character of yellow sap and certain similarities of habit. Included here are A. mexicana L., A. grandiflora Sweet, A. alba Lestib., and the southwestern A. intermedia Sweet, as well as two or three doubtful entities.

Whether some or all of these white-flowered plants should be looked on as color varieties, not specifically distinct from A. mexicana, is a question well worth answering, but only incidental to an account of Nevada representatives. Still in point is how to separate A. intermedia from A. platyceras, assuming of course they are to be separated.

Without inferring the least disesteem to a respected Western botanist, it may be worth while to insert a bit of skepticism as a caveat. Beyond its incorporation into the generic description in Rydberg's two manuals, and out-and-out dismissals by Rose and Fedde, no one has reported testing Nelson's observation of the variance in sap color in Argemone. True it is all the data at hand point to the constancy of this character, it would none the less be reassuring to know for certain that it will serve to separate A. platyceras and A. hispida wherever they grow together. The differences made use of in manuals to identify the two species are unconvincing and in a sizeable proportion of specimens they fade to point of uselessness. If there were available ample suites of specimens with the sap color of each stated, it is quite conceivable that supplementary characters might be worked out for use in the herbarium. There is evidence that fruit and seed differences exist between the two species, but this is of limited use because the great bulk of specimens is taken in flower. So far collectors almost without exception have failed to note sap color, and as it is obviously not a character to be ascertained in the

herbarium, we shall have to limp along for a while with traditional distinctions.

Before we have done with the matter there is a final note to be added. The original description of Argemone platyceras was based on plants grown in Berlin from seed collected in Vera Cruz by Schiede and Deppe. Some rather striking habit differences are disclosed when specimens from middle Mexico and the Great Basin are compared, and Rose may have been correct in restricting A. platyceras to Vera Cruz and neighboring States. In which case there is no shortage of names for the northern plant. I have found no note of sap color in the Vera Cruz plant.

4. ARCTOMECON Torr. & Frém.

ARCTOMECON Torr. & Frém., in Frém., Rep. Exped. Rocky Mount. 312. 1845; Benth. & Hook., Gen. Pl. 1: 52. 1862; Parry, Amer. Natural. 9: 139. 1875; Gray, Proc. Amer. Acad. 12: 52. 1876; Prantl & Kündig in Engl. & Prantl, Natürl. Pflanzenfam. 3 (2): 142. 1891; Coville, Proc. Biol. Soc. Wash. 7: 66. 1892, and Contrib. U. S. Nat. Herb. 4 (Bot. Death Valley Exped.): 58. 1893; Robinson in Gray, Syn. Fl. N. Am. 1 (1): 85. 1895; Fedde, Pflanzenreich 4 (104): 134. 1909; Jepson, Fl. Calif. 1 (7): 562. 1922; Tidestr., Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925.

Sepals 2 or 3, broadly obovate-elliptic with asymmetric apices; petals 4 to 6, broadly obovate, deciduous or persistent; stamens numerous, with filiform or slightly dilated filaments longer than the anthers; ovary 4 to 6-carpellate, with nerviform placentae; styles short or wanting, the stigmas erect, and fused to form a clavate or knob-like body; capsule coriaceous, opening by reflection

of the valves from the top; seed (not seen in A. merriami) several, black, smooth, crested with the raphe.

Perennial herbs, much branched at the crown to form dense colonies; leaves clustered near the ground, and the showy white or yellow flowers either solitary or in subumbelliform racemes or panicles, and raised on naked or leafy-bracted peduncles. The pubescence of the genus is characteristic, consisting of long, setose-barbellate hairs from enlarged bases.

Type species: A. californica Torr.

There are three species in all, the following two from Nevada and A. humilis Coville of southwestern Utah. All three species occupy remarkably restricted ranges. The character of dilation of the filaments, stressed by Coville, is not used here, since on examination of a series of specimens it appears untrustworthy.

The generic name was formed by combining the Greek words for bear and poppy, in allusion to the hirsute nature of the pubescence.

Arctomecon californica, the first known species of the genus, was found early in May 1844 at a single station on the banks of a creek near Las Vegas by the famous exploring expedition led by Lieutenant (later General) John C. Frémont. In July of the same year, when the return journey was nearly completed, and as the expedition camped by the Smoky Hill River in western Kansas, an unexpected rise of the river flooded the camp and greatly damaged the few botanical specimens surviving the long overland trip.

The specimens, such as they were, were sent to John Torrey, who prepared the botanical appendix to Frémont's report, wherein the genus was described. The misfortunes befalling the collections reasonably account for the shortcomings of what Gray called "the wretched figure" that accompanied the description.

In 1874 C. C. Parry came upon a showy papaveraceous plant near St. George, Utah. This he took to be the same species discovered by Frémont thirty years before, and finding his plant not entirely jibing with Torrey's description and plate, he went on to mend the earlier diagnosis. Without seeing Frémont's plant, which they correctly guessed to have been taken in Nevada, Brewer and Watson in their "Botany of California" blended the descriptions of Torrey and Parry. In the same year (1876), Asa Gray, still supposing the specimen of Frémont, which apparently he had not seen, and the one of Parry to represent the same species, completely revised Torrey's characterization of the genus and species.

It should be added that the locality for Frémont's plant as published was so indefinite that it could have been taken nearly anywhere along the southwestern part of his itinerary. However, in connection with the work of the Death Valley Expedition, Dr. Vernon Bailey collected between Cottonwood Creek and Vegas Ranch in what is now Clark County. This was precisely the same ground passed over by Frémont 47 years - almost to the day - earlier;

and there Dr. Bailey made the second collection of A. californica. A subsequent check on the label of Frémont's plant bore out the conjecture that the two specimens came from the same locality. To this day A. californica is known only from the environs of Las Vegas.

Frederick V. Coville, the botanist of the Death Valley Expedition, was the first to see that the discrepancies concerning Arctomecon between Torrey on the one hand and Parry and Gray on the other were due simply to the fact that two species were involved. The one collected by Parry at St. George, Coville named A. humilis; and in the same paper he described as A. merriami another collection of the Death Valley Expedition.

When the unique characters and habit of the species are considered, it is surprising that so little information concerning them is available. An effort to bring A. californica into cultivation was reported a few years ago, but with what success I have never learned. No seedsman's catalogue lists any of the species and mention of the genus in horticultural literature has been noted only twice. Of the three species, A. humilis, the species from St. George, Utah, especially merits a trial in cultivation. The low plants, bearing umbelliform racemes of large, white flowers with persistent corollas (almost an anomalous condition in this family) are as beautiful as any of its more favored cousins.

KEY TO SPECIES

Flowers solitary; sepals pilose; petals white, deciduous, 3 to 4 cm. long; styles present; capsule oblong linear, 3.5 cm. long. . . . . 1. A. merriami.

Flowers few to several in umbelliform racemes or panicles; sepals glabrous; petals yellow, rather persistent, less than 3 cm. long; styles absent; capsule obovoid-pyriform, less than 2 cm. long. . . . . 2. A. californica.

1. ARCTOMECON MERRIAMI Coville, Proc. Biol. Soc. Wash. 7: 66. 1892; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925.

Leaves 2 to 7 cm. long, narrowly flabelliform, with a truncate, coarsely toothed apex, or ovate with the apex acute and entire, pilose-hispid; stems pilose-hispid below, glabrous above, continued as a long (25 to 35 cm.), naked, simple (or rarely branched and then with a bract similar to the leaves), 1-flowered peduncle; sepals 3, 2 cm. long, long-pilose; petals 6, 3 to 4 cm. long, white, deciduous; ovary oblong-elliptic or clavate, 6-carpellate; styles short but definitely discernible, they and the stigmas fused to form a clavate body; capsule (seen in one collection only) oblong linear, 3.5 cm. long, opening by reflection of the valves near the apex.

Southern Nevada and the Death Valley region, California.

Illustrations: Contrib. U. S. Nat. Herb. 4 (Bot. Death Valley Exped.) t. 2.

Nevada: Clark County - between Cottonwood Creek and Vegas

Ranch, Merriam & Bailey, 1 May, 1891 (type); saddle [sandy ?] and gravelly slopes south of Indian Springs, Clokey 8238; Desert Valley, 2 miles west of Las Vegas, Train 1651; top of Dead Man Canyon, Desert Game Range, Allen 103.

2. ARCTOMECON CALIFORNICA Torr. & Frém., Rep. Exped. Rocky Mount. 312. 1845; Tidestrom, Contrib. U. S. Nat. Herb. 25 (Fl. Utah & Nev.): 216. 1925.

Leaves 3 to 9 cm. long, clothed with long brown hairs, narrowly flabelliform, the apex coarsely toothed; stems 25 to 40 cm. high, erect or ascending from decumbent bases, pilose-hirsute below, glabrous above, naked except for the pilose-hirsute (the uppermost glabrous), sessile, ovate, entire bracts; flowers 3 to 15; sepals 3, glabrous, 1.5 to 2 cm. long; petals 4 to 6, commonly 5, deep yellow, 2 to 2.5 cm. long, rather persistent; ovary ovoid-globose, 5 to 6-carpellate; stigmas sessile, fused to form a knoblike body; capsule obovoid-pyriform, 1.2 to 1.8 cm. long, opening by reflection of the valves at about the middle.

Southern Nevada.

Illustrations: Frém., Rep. Exped. Rocky Mount., Bot. app. t. 2 (opp. p. 320); Nat. Hort. Mag. 13: 349, 350.

Nevada: Clark County - desert flat west of Las Vegas, Clokey 5837; a few miles west of Vegas Ranch, Merriam & Bailey, 1 May, 1891.

Since the third species of the genus, A. humilis Coville, grows in Utah at no great distance from the Nevada line, its

appearance in the latter State should occasion little surprise; but in view of the strictly begirt distributions of these species, any prediction of extension would be hazardous.

5. GLAUCIUM Mill.

GLAUCIUM Mill., Gard. Dict. abr. ed. 4. 1754; Benth. & Hook., Gen. Pl. 1: 53. 1862; Prantl & Kündig in Engl. & Prantl, Natürl. Pflanzenfam. 3 (2): 141. 1889; Gray, Syn. Fl. N. Am. 1 (1): 90. 1895; Fedde, Pflanzenreich 4 (104): 221. 1909.

Sepals 2; petals 4, soon falling; stamens numerous; ovary linear, 1-celled, 2-carpellate, multi-ovulate, the stigmas nearly sessile, subreniform, the margins thickened and stigmatiferous; capsule elongate, linear-cylindric, 2-celled by the development of a spongy outgrowth of the placentae in which the seed are imbedded, dehiscing by valves, the placentae and false septum remaining in situ and surmounted by the now enlarged stigmas; seed numerous, black, cancellate, crestless.

Annual, biennial or perennial herbs with acrid, saffron-colored juice, alternate, sessile, toothed or lobed leaves, and more or less showy flowers borne on short, leafy-bracted, lateral peduncles.

Type species: Chelidonium glaucium L. (Glaucium flavum Crantz).

Species about 6, all Old World, with distribution centering about the Mediterranean Basin. Three species are listed as being in cultivation, and while in the better strains the flowers are not unattractive, the quickly deciduous petals coupled with the

weedy mien of the plants, are enough to keep the discriminating gardner from ever surrendering his heart to them.

1. GLAUCIUM CORNICULATUM (L.) Curt., Fl. Lond. fasc. 6. t. 32. 1794 ? [8] Based on Chelidonium corniculatum L., Sp. Pl. 506. 1753.

Annual; a tuft of oblong, coarsely pinnatifid, petioled leaves at the crown; cauline leaves similar but shorter and sessile; all of the leaves sparsely furfuraceous pubescent; stems to 20 cm. high, branched, zig-zag, pubescent; sepals ca. 12 mm. long, oblong-lanceolate, narrowed to a calloused apex, asymmetric, sparingly furfuraceous pubescent; petals ca. 15 mm. long, broadly obovate, yellow with a red base; stamens ca. 20, the filaments filiform and much longer than the oblong anthers; ovary covered by long, appressed hairs from enlarged bases; capsule 10 to 15 cm. long, sparingly appressed pubescent, and dehiscing from the apex downward; the stigmas forming in fruit a body shaped like a fore-and-aft hat.

A number of varieties, based mostly on flower size and color, are maintained by some European authorities. As these characters are hard to check in dried specimens, and not very convincing in this family anyway, no attempt is made here to

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[8] I have not been able to check this citation. The volume number is omitted because binders did not uniformly follow the directions issued by Curtis. Various dates of issue have been assigned the different fascicles of Flora Londinensis. I have chosen the one doubtfully suggested in Rep. Bot. Exch. Club Brit. Isles 5 (3): 412. 1918.

refer our single collection further than to species.

Mediterranean region, north through the Balkans to Germany; Canary Islands and the Near East. The introduction of the plant into Nevada, apparently a first record for the New World, is unexplained.

Illustration: Pflanzenreich 4 (104): 226.

Nevada: Storey County - Rocky clay hillside, American Flat Canyon, 5 miles south of Virginia City, *Allen 500*, 30 August, 1937.

Another species, *G. flavum* Crantz, is sparingly naturalized in the Atlantic States and in southern California. It is distinguished by its larger, pure yellow flowers, glaucous herbage, and glabrous stems and capsules.

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